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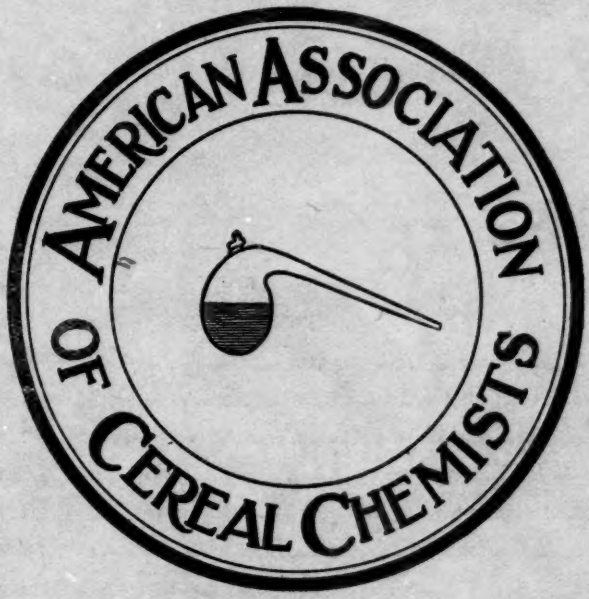


VOL *IV.* *July, 1919* No. 1

SUSTAINING MEMBERS

Western Canada Flour Mills Co.....Winnipeg, Man., Can.
Gooch Milling & Elev. Co.....Lincoln, Neb.
Wichita Milling & Elev. Co.....Wichita Falls, Tex.
Larabee Flour Mills Corporation.....Kansas City, Mo.
Eagle Roller Mills Co.....New Ulm, Minn.
Southwestern Milling Co.....Kansas City, Mo.
The Fleischmann Co.....New York, N. Y.
The Hoffman Mills Co.....Enterprise, Kans.
Iemert-Hincke Milling Co.....Kansas City, Mo.
El Reno Mill & Elev. Co.....El Reno, Okla.

THE JOURNAL

OF THE

AMERICAN ASSOCIATION

OF

CEREAL CHEMISTS

Published by the American Association of Cereal Chemists.

VOL. IV *July, 1919* No. 1

KANSAS CITY MEETING

AMERICAN ASSOCIATION OF CEREAL CHEMISTS, MAY 29, 30, 31, 1919

Morning Session, first day, May 29:

Meeting called to order by Pres. C. J. Patterson, in Doric Room, Hotel Baltimore, at 10:15 a. m.

A. A. Jones appointed Secretary pro tem in absence of Mr. Gordon.

The following members answered roll call: J. M. Hogan, F. D. Patterson, R. Wallace Mitchell, R. B. Potts, R. A. Lusk, H. F. Vaupel, A. W. Estabrook, A. R. Sasse, L. E. Leatherock, H. E. Weaver, A. A. Jones, C. J. Patterson, Dean Yohe, L. H. McLaren, J. R. Hess, C. F. Buck, S. J. Lawellin, J. C. Wood.

Visitors present as follows: Dr. Jacobs of Washington, D. C.; J. R. Genung, Galveston, Texas; Roy V. McVey, Topeka, Kansas; Mr. Ingles, San Francisco, Cal.; H. M. Christmas, St. Joseph, Mo.; O. W. Harper, Salina, Kansas; R. G. Clark, Kansas City, Mo.; Hugo Roos, Kansas City, Mo.; F. A. Anderson, Chicago, Ill.; F. A. Strange, Anthony, Kansas; C. F. Yeager, Chicago, Ill.; H. C. Barker, Schuyler, Nebr.; G. S. Lyman, Kansas City; R. S. Conklin, Kansas City; Miss Z. Z. Titus, Kansas City; Miss Esther Redmond, Yukon, Okla.

Opening address by President C. J. Patterson.

Mr. Patterson touched upon the needs of our Association membership, including not only flour mills, but other lines of food industry as well. Mr. Patterson also pointed out that the laboratory department which limited itself merely to routine tests of flour and wheat for uniformity was bound to be a failure sooner or later and that our success must be due to increased efficiency in other lines as well; for example, the analysis of the fuels, oils, greases and so on in use around the plant, and which should be purchased only upon consultation with the head chemist. We must include any and all branches of the plant which will bring increased efficiency of the plant as a whole, with the lowest cost to the employer.

Letter read from Dr. LeClerc, Secretary of the Society of Milling and Baking Technology.

Letter read from the Merchants' Association of New York urging us to take advantage of New York's facilities as a convention meeting place.

Letters read from absent members: Lt. Leslie R. Olsen, Camp Upton, N. Y., and A. H. Porter, New Prague, Minn.

President Patterson requests every member to notify the President of the Association after a meeting is announced, whether he will or will not be present at the meeting. This will greatly help the committee in charge in preparation and should be attended to without fail. Don't forget this next time!

Open discussion followed, starting with Weaver and continued by F. D. Patterson, Potts and Leatherock regarding relationship which should exist between the chemist and the head miller. A large majority of those present reported harmony existing.

Mr. Vaupel discussed long tempering of wheat as an important factor in reducing yield. This brought forth a most interesting discussion both pro and con. It was brought out that there was a point where increased moisture content of the wheat was over-balanced by the yield. This point must be determined and a standard established for the same but that the long still temper up to 72 hours was conductive to low yield. This point was thought worthy of investigation.

Mr. Lawellin described a burette which he had devised and had made up to his specifications which was graduated inversely and read the percent of protein direct when the standard solutions were made up to correspond with the reading.

Adjournment was voted till 2:00 p .m.

Afternoon Session, first day, May 29:

Meeting called to order by President Patterson, at 2:00 p. m.

Mr. C. F. Yeager, National Secretary of the American Association of Bakery Superintendents, gave a most interesting address on "Proper Fermentation Through Laboratory Control of the Bakery." Mr. Yeager answered many questions and brought forth much discussion.

President thanks Mr. Yeager for presenting paper.

Motion to adjourn, carried.

The Kansas City Section of the American Chemical Society tendered the Association a banquet at 6:30 p. m., at the Hotel Baltimore, which was followed by an entertainment at the theatre, both of which were immensely enjoyed and heartily appreciated. Dr. Dane of Kansas University gave the address of welcome at the banquet and his remarks showed the genuineness of the hospitality of the Kansas City Section.

Morning Session, second day, May 30:

Meeting called to order by President Patterson.

Executive Committee reported acceptance of the following applications for membership:

Geo. L. Brendell, Larabee Flour Mills Corpn., St. Joseph, Mo.

H. C. Barker, Wells-Abbott-Nieman, Schuyler, Nebr.

Roy V. McVey, Ismert-Hincke Milling Co., Topeka, Kansas.

Rollin G. Clark, Campbell System, Kansas City, Mo.

Roy K. Durham, Weatherford Milling Co., Weatherford, Okla.

O. W. Harper, Robinson Mills, Salina, Kansas.

L. Maher, Larabee Flour Mills Corpn., Clinton, Mo.

J. R. Genung, Texas Star Flour Mills, Galveston, Texas.

Rolfe Frye, Goodlander Mills, Fort Scott, Kansas.

G. S. Lyman, Ismert-Hincke Milling Co., Kansas City, Kansas.

Committee appointed to notify above men of acceptance of their membership. All these applicants present except Brendell, Frye and Durham.

Proposition brought forth upon request of Dr. LeClerc of the Society of Milling and Baking Technology regarding a merger of their society with ours, dropping the names of each and adopting a new one. Lively discussion followed.

Dr. B. R. Jacobs, representing the S. M. B. T. then presented the matter of merging the two societies. The President asked Dr. Jacobs to give us a little time to present our conclusions to him.

Motion made and seconded to reject the proposition of the S. M. B. T., as presented by Dr. Jacobs. Motion carried.

Motion made and carried that a committee be appointed to draw up resolutions to present to the S. M. B. T., through Dr. Jacobs, answering their proposal. Following committee appointed: Estabrook, Weaver, Mitchell, Lusk, Potts, McLaren, Jones, Sasse.

Resolution prepared and read to the Association and approved as follows:

Hotel Baltimore, Kansas City, Mo.

Resolved by the American Association of Cereal Chemists, in session at Kansas City, Mo., May 30, 1919, considering the proposal of the American Society of Milling and Baking Technology, as presented by Dr. Jacobs:

That at the present time the members of the two Societies are not well enough acquainted with the requirements, purposes and aims of one another to amalgamate the two societies.

It is suggested that each society appoint a committee to discuss the matter of uniting and bringing before each society their conclusions for final action.

Trusting that the above resolution will meet with the approval of the Society of Milling and Baking Technology and urging prompt action to hasten the results anticipated by them as suggested.

Signed:

Committee—C. J. Patterson, R. B. Potts, H. E. Weaver, A. R. Sasse, A. A. Jones, L. H. McLaren, R. A. Lusk, R. Wallace Mitchell, A. W. Estabrook.

Motion by Weaver to elect officers before adjourning for lunch. Motion seconded and carried.

Nominations for the election of officers for the ensuing year were now announced.

Nominations for the office of President as follows: Mitchell. Sasse. Leatherock. Mr. R. Wallace Mitchell elected.

Mr. Mitchell takes the chair and after a short word of acceptance asks that the election of officers proceed.

Nominations for Vice President and Business Manager as follows: Southwell. Lawellin. McLaren. Mr. C. R. Southwell re-elected.

Nominations for Secretary and Treasurer as follows: C. J. Patterson. Sasse. Jones. Vaupel. Majority not obtained. New ballot required. C. J. Patterson elected. Mr. Patterson takes the chair and continues the minutes.

Nominations for Chairman of the Executive Committee as follows: Lusk. Hess. Weaver. Majority not obtained. New ballot required. Mr. H. E. Weaver re-elected.

Nominations for Editor of the Journal as follows: Jones. Lawellin. Buck. Mr. A. A. Jones elected.

Motion carried to adjourn forty-five minutes for luncheon.

Afternoon Session, second day, May 30:

Meeting called to order by President Mitchell at 2:15 p. m.

The first paper was by Prof. E. L. Tague of the Kansas State Agricultural College, entitled "Some Neglected Constituents of Flour." Prof. Tague's paper was most interesting and brought out considerable discussion. Prof. Tague then consented to discuss "Hydrogen Ion Concentration," for the benefit of those who had not heard him at the American Chemical Society last winter. President expresses to Dr. Tague the appreciation of the Association for his presentation of this excellent paper.

Dr. Jacobs of Washington, D. C., gave the next paper, entitled, "Pentosans and Starch as a Basis for Evaluation of Wheat for the Mill." This paper brought out some discussion. President thanks Dr. Jacobs for presenting this paper at our meeting.

Meeting was adjourned to attend the annual banquet of the Association at 6:30 p. m., at the Hotel Baltimore.

Following the banquet, Mr. Hugo Roos, acting as toastmaster, called upon everyone present.

Morning Session, third day, May 31:

Meeting called to order by President Mitchell at 10:00 a. m.

Discussion opened in regard to amending the constitution to include men who cannot pass the membership requirements in regard to education but who have educated themselves and have had five years' experience in the laboratory .

Moved by Sasse that we do not amend the constitution in this regard. No second. Out of order.

Moved by Weaver that the clause relating to membership be amended so that five years' experience in cereal laboratories would be accepted in lieu of two years of College work required. Motion seconded. Motion lost by vote of 16 to 4.

C. J. Patterson expresses desire of A .A. C. C. to include in membership all engaged in food chemistry, including the cracker industry, yeast and food manufacturers of all kinds. The constitution does not exclude such representatives and an invitation is extended to them.

Question of admitting the fair sex to membership brought up. There was no discussion.

Secretary read the article in the last Journal regarding "Sustaining Membership," and also the minutes of the last meeting as published in the December, 1918 Journal.

Question if any changes in the minutes. Weaver states Hess' paper incorrectly titled. Weaver states that he made no motion to accept as official the loaf measuring device of the Industrial Appliance Co.

Motion by Weaver to adopt minutes of last meeting as published with the above corrections. Motion seconded and carried.

Mr. Patterson, Secretary, read the report of the Treasurer covering the past year as far as possible. Expense of exchanging samples was read and the Secretary instructed to write to Loomis to see if this bill had been paid. Expense of getting out the last Journal read and approved. Treasurer's statement showed balance, $130.17, deducting expense of last Journal, $86.13, left $44.04. Receipts from advertising brought this up to $66.44. Dues collected and so on, brought balance on hand up to date to about $135.00.

No check on dues paid last year. Motion made by Weaver that all those in good standing last year be continued in good standing this year. Motion seconded and carried.

Motion by Weaver that report of Secretary-Treasurer be accepted. Motion seconded and carried.

Mr. Patterson read letter asking for back numbers of the Journal from the U. S. D. A. Librarian. It was suggested that a file of extra Journals be saved from each issue.

Report of the Editor read by the Secretary.

Mr. Jones requests co-operation of each member throughout the year, and asks for papers, abstracts and notes.

The following replied to request for volunteers for material for the July Journal: Sasse, Lusk, Lawellin, Hogan, Buck, Hess, Barker, Leatherock and Yohe. Mr. Weaver promised something for the December Journal.

President Mitchell suggested a section of the Journal to list new books with a recommendation as to their application to our use.

Motion by Jones that the President appoint one man to head a research department who will be responsible for co-ordination of endeavor along research lines. Motion seconded and carried.

Motion by Weaver that a committee of three be appointed to meet with a similar committee from the S. M. B. T. to exchange ideas regarding the joining of the two societies. Motion seconded and carried.

Mr. H. E. Weaver made a short talk on Chemical Independence of America, followed by similar talks by C. J. Patterson and F. A. Anderson.

Meeting adjourned for luncheon.

Afternoon Session, third day, May 31:

Meeting called to order by President Mitchell at 2:00 p. m.

It was suggested that the Association should be represented at the meeting of the Federation of Operative Millers of America next week. It was moved and seconded and carried that C. J. Patterson be appointed to represent this Association at the F. O. M. A. convention.

The paper by L. H. McLaren of the Ismert-Hincke Milling Co., followed, which was a continuation of last year's paper by Patterson and McLaren on Protein Hydrolysis, entitled "Separation of Some of the Amino Acids from Wheat Protein." This very interesting paper was followed by discussion.

Mr. J .R. Hess appointed head of research department.

Mr. A. A. Jones appointed to write a note of appreciation of Association to the management of the Hotel Baltimore for the use of the meeting rooms.

Motion to adjourn this meeting carried.

WELCOME HOME

How good that word "home" sounds when you are actually back in the harness again, just to be able to go your own free way again and be near those dearest to you.

We are glad to have you back with us, fellows, and we give you the right hand of fellowship. Nobly done, men. Most of you gave up your old positions without thought of the future, to enter the service, only to return and find serious changes ahead of you. We are glad you are located now and ask your co-operation once more. We pledge you ours.

SEPARATION OF SOME OF THE AMINO ACIDS FROM WHEAT PROTEIN

The amino acids have always been considered a very important class of compounds from a physiological standpoint. Considerable work has been done trying to determine their dietetic value in foods and some very good results have been obtained. Their relative action in the dough has been studied, but no definite relationship

has been worked out. There is no doubt that they are important in determining the baking quality of the flour. It seems to me that if we are to put out a uniform flour that we will have to base our standards on the quality of the protein in the flour and not on its quantity. The purpose of making these separations was to obtain some idea as to the nature of the amino acids and determine some of their properties. It seems as though there has to be a starting point, so I have started here in hopes that someone else will work out a method which we can rely on.

The amino acids comprise about 60-65% of the protein of the wheat. Their separation as single acids in a pure state is rather difficult, as they decompose so readily if subjected to fractional distillation and very few of their insoluble salts have been discovered, so their precipitation is rather difficult. Even with the present methods which we have their yield cannot be considered as quantitative.

There are about twelve amino acids which have been detected in the wheat protein, but some of them occur in very small percentages and only those appearing in the larger percentages will be mentioned here. These are mostly mono-amino acids, with the single acid groups and one occurring with two acid groups. The four which I have worked on, the single acid groups, are glycine (Amino-Acetic), Alanine (amino-propionic), leucine (amino-isocaproic), the one with two acid groups is glutamic (amino-glutamic).

	Solubility in 100 Parts.					Crystaline
	Water	Alcohol	Ether	M. P.	B. P.	Form
Glycine	23.2	insoluble		232.6°C		Rhombic
Alanine	4.6	.2in80%	insoluble	297°C		
Leucine	2.2	.06in80%	insoluble	300°C	Dec.	Leaflets
Glutamic	1.0	S. Sol.	insoluble	198°C	Dec. 206	Rhombic

Hydrolysis was carried out in a slightly different way than heretofore. The sample was heated with twenty times its weight of 1.5% hydrochloric for about an hour under a pressure of 25 lbs. per square inch, and the temperature raised to 125°C. The mixture was allowed to cool and then centrifuged and the clear liquid heated with 20% hydrochloric for 12 hours and the residue heated with about ten times its weight of 20% hydrochloric for 18 hours. The two solutions were filtered and washed well with hot water, the filtrates combined and the excess hydrochloric distilled off under vacuum. The advantage of first heating with a weaker acid is that it seems to start hydrolysis at a faster rate and the formation of humin does not seem to be so great. The pressure and high temperature aids in breaking up the cells and gives the stronger acid a better chance to work. In the next step, heating the residue and clear liquid separately, gives better results than heating them both together with the acid.

There are several methods of separation of the various amino acids and the choice of the method depends upon the nature of the substance which has been hyrolyzed and the purpose of separation. If one wishes to make a quantitative determination one method may be used and to obtain them in a pure state another method has to be used. Since in this paper an attempt will be made to separate the acids in a pure state and only those methods which apply to this will be given.

There are two general methods for separation of the amino acids. (1) Precipitation with phosphotungstic acid, (2) by converting the acids into the ethyl esters and extracting with

ether. There are also several other methods for specific amino acids and they will be mentioned later.

In the ester method, the solution of the acids is evaporated down until it is practically free from water. Three times the volume of absolute alcohol is added and dry hydrochloric acid gas is passed into the solution. As water is formed during the reaction the alcohol solution is evaporated off, thus removing the water. The same amount of absolute alcohol was added again and the solution again saturated with hydrochloric acid gas. The solution cooled with ice and salt mixture, was then placed in a separatory funnel and an equal amount of ether added. The esters were freed from their hydrochloride salts by neutralizing with 20% sodium hydroxide solution. Several extractions were made until the ether was no longer colored. The ether extract was placed in a double distilling flask and the ether distilled off under vacuum. The residue is an oily brown liquid and contains a mixture of the ethyl ester of the amino acids. These are distilled under vacuum. The ethyl ester of glycine and alanine distill over so close together that unless a large quantity is used, it is rather hard to make a separation, so in this work no attempt was made to separate the two.

In the separation with phosphotungstic acid the hydrochloric acid solution is evaporated and treated with 30cc of a solution containing 20 grams of phosphotungstic acid and .5 gram of sulfuric acid for each 100cc of amino acid solution. The precipitate is allowed to settled for 24 hours. then filtered and washed with a solution of 2.5 grams of phosphotungstic acid and 5 grams sulfuric acid per 100cc. The precipitate is removed with a spatula and the filter paper washed with water just alkaline. The precipitate is stirred to break up any lumps and dissolved by adding 50% soda until end point is reached, using phenolphthalein as an indicator. The solution is diluted about half and the phosphotungstic acid removed by adding slowly 20% barium chloride until a few c.c. of the clear liquid gives a precipitate with a neutral solution of sodium sulfate. A large excess of barium chloride should be avoided. The solution is evaporated to a small volume and any barium phosphotungstic which settles out is filtered off.

The fact that the hydrochloric salt of glutamic acid is very insoluble makes an easy means of separation of this acid. However, all of the glutamic acid is not precipitated as the hydrochloride, so this cannot be used as a means of quantitative determination. The filtrate from above is concentrated and dry (HCl) is passed into a part of the solution, the mixture placed in an ice mixture for 24 hours. The precipitate is filtered and washed.

To the other part of the fitrate a solution of picric acid is added. As glycine forms an insoluble salt with picric acid, this gives a method of separating glycine. A large amount of picric acid should be avoided as the solubility of the salt increases with large amounts of picric acid.

Conclusions.

The amino acids are neutral compounds ,the NH_2 groups neutralizing the COOH group in the same molecule. The effect is not due to any acid property, but due to the peculiar acid itself.

They form esters readily which are pleasant smelling compounds, but an odor which is different from the fatty acids.

The hydrochloride salts of the acids are easily formed and the greater part of them are insoluble.

L. H. McLaren.

CHEMICAL INDEPENDENCE IN AMERICA

For years users of laboratory materials have been deluded with the idea that only Germany was able to put on the market wares whose standards were adapted to the exacting needs of chemical analysis.

Propaganda, which is such an arbitrary quality, becomes an actuality as applied to chemicals and laboratory supplies in general.

For years German chemists in the hide and leather industries, brewing chemists, and others interested in the welfare of the German products have always had the same story to tell. "In America you have not the men, materials, or knowledge of the art of making chemical glassware, porcelain, dyes, and chemicals of highest purity. Germany is supreme and in America you will never learn how to do it."

Over and over we have had the same ideas forcibly brought to our attention and we actually believed all we were told. However, in the past three years vast strides have been made. Several standard grades of glassware have been put on the market. The writer has in the past three years, visited approximately five hundred industrial laboratories and in every case Pyrex has been said to be vastly superior to the celebrated Jena ware. Other grades similar to the Bohemian ware have also been found satisfactory in performance, shape and size.

The best grades of American porcelain are, by the concensus of opinion, equal to the Royal Berlin and Meissen ware.

The situation with regard to dye stuffs needs no mention.

With regard to chemically pure chemicals, American manufacturers are making chemicals equal in purity to that of Kahlbaum and Schuchardt.

There is one point, however, that American manufacturers have overlooked. That is the matter of refinement in line and design. Shape and size are important, it is true, but very often the makers of various wares overlook detail such as shape and depth of lip, width of flanges on flasks, etc., which are so important to the routine users in various industrial laboratories.

The standards adopted by the American Bureau of Mines and the American Society of Testing Material, are world wide. A set of standards, such as these, if followed by all American manufacturers, would insure acceptance by Industrial Chemists.

The manufacturers must be linked to the routine users by constructive criticism by the logical intermediate, the jobber. Only in this way will we be able to overcome the faults now found in various products.

Perfection has come in German made laboratory materials through long years of experience in mechanical manipulation. In many of the industries, several generations have often been engaged in the manufacture of the same article. This is the reason for clean cut lines and perfection of finish.

The time is at hand when chemists must unite in the service of a common cause. Specify and accept only American made goods. Educate owners, managers, and purchasing agents so they will do likewise. Surely in our American educational institutions we should have American made goods.

Buy Japanese or German made goods and you are taking bread from the mouths of the American chemists. Duty free importations should be a thing of the past. Protection must be given to the manufacturers who have their capital tied up in the industries. Therefore it is an injustice to the manufacturers if educational institutions are permitted to

bring imported goods into the country on the duty free basis.

"The greatest benefactors today are those men who are seeking to arouse and build up a deep-seated love of country and a reverence for American institutions." This policy is certainly bound to produce a wholesome, sane and forward looking public opinion and assist in bringing about Chemical Independence in America.

F. A. ANDERSON.

Hurrah for the Kansas City Section of the American Chemical Society! We surely did appreciate your treat of May 29th and we are glad to make your acquaintance.

AUTO DIGESTION OF YEAST AND THE EFFECT OF THE AUTOLYSATE ON FERMENTATION

Yeast foods are the subject of much investigation at the present time as it is well known that the quality of bread depends very much on proper fermentation of the dough. Active fermentation in the latter stage of the fermenting process, especially in the pan, is very desirable.

When yeast is digested with water at a temperature of 40° C., 81% of the contents of the yeast cells will be liberated within 24 hours. One gram of the yeast containing 23.1 milligrams of nitrogen after digesting one hour with water 1.19 milligrams of nitrogen passed into solution and after 24 hours 18.69 milligrams was found in the autolysate. Digesting for 29 hours longer did not increase the amount materially; the residue left after filtering showed the yeast cells to be shrunken when examined under the microscope.

The following method was used to determine the progress of the digestion:

To 40 grams of yeast contained in a 500. cc flask, 400. cc of water and 1. cc of Chloroform was added. The flask was stoppered and placed in an incubator kept at 40 to 41°C. Samples were taken by shaking the flask thoroughly and the required amount poured off and filtered for analysis. The progress of the autolysis was measured by Amino nitrogen using the Sorensen method, acidity and total nitrogen. The results are shown in table 1.

TABLE 1.

10. cc of filtrate used for each determination, representing 1 gram of yeast.

Color or Filtrate	Acidity cc N/10 Alkali	Amino Nitrogen Sorensen Method milligrams	Total Nitrogen milligrams
Digestion 1 hour at 40°C—Colorless	0.3	0.21	1.19
Digestion 3 hours at 40°C—Light Straw	0.3	0.63	2.80
Digestion 4 hours at 40°C—Straw	0.75	1.54	
Digestion 5 hours at 40°C—Straw	0.80	2.17	
Digestion 24 hours at 40°C—Yellow	1.70	5.60	18.69
Digestion 53 hours at 40°C—Yellow	2.30	5.60	18.75
Entire yeast—1 gram			23.10

At the end of 24 hours samples were drawn and filtered several times through paper. It was found the filtrate would not ferment a cane sugar solution but would stimulate the production of gas in a sugar solution to which yeast had been added. The results are shown in Table 2.

Experiment Showing Increase in Gas Production in Sugar Solution, Using Yeast Autolysate.

	20 gm. Sugar 10 gm. Yeast 125 cc. Water 75 cc. Autolysate	20 gm. Sugar 10 gm. Yeast 200 cc. Water
Minutes Fermented at 29°C	cc of CO_2	cc of CO_2	cc of CO_2 increase
60	170	160	10
30	300	150	150
30	326	236	90
15	200	105	95
15	230	110	120
15	220	96	124
15	248	112	136
Total, 180	1694	969	725

Baking experiments were made to determine the effect of adding the yeast autolysate to the dough. When added alone we noted the same result as in the cane sugar solution, that no fermentation took place. But when used in the dough containing yeast the fermentation was very active and produced a marked improvement in the bread. The baking test is given below:

BAKING TEST.

Experiment	A	B
Yeast Grams	10	10
Yeast Autolysate Cubic Centimeters	0	50
First Rise—minutes	111	121
Second Rise—minutes	69	54
Third Rise—minutes	51	39
Time in pan—minutes	59	45
Total Fermenting Period—minutes	290	259
Volume of loaf	100	100
Texture	100	101
Color	100	101

Conclusions

When yeast is digested with water at a temperature of 40°C. for 24 hours, 81% of its total nitrogen will be liberated from the cell.

The autolysate will not ferment a cane sugar solution or dough but when living yeast is present the fermentation will be stimulated to a marked degree and when added to dough an improvement will be noted in texture and color of the bread.

A. R. SASSE.

A. A. C. C.

*A*ttention brothers!
*M*ost of you sooner or later
*E*xpect to be able to present a
*R*eport on some line of work
*I*ncomplete at present perhaps.
*C*an't you write up your data
*A*nd get it NOW for the
*N*ext Journal in the fall.

*A*ll right then,
*S*o far so good. You know
*S*eeing is believing and to perfect
*O*ur organization we must all
*C*o-operate in spirit and work
*I*n order to bring this about.
*A*sk for something from
*T*he research department
*I*n charge of J. R. Hess at the
*O*maha Flour Mills Co., Omaha,
*N*ebraska, if you wish.

*O*ffer suggestions to others
*F*or the good of all.

*C*oncentrate on your subject.
*E*very point you prove will
*R*egister an ultimatum and
*E*ach conclusion drawn means
*A*dvancement. Are you advancing?
*L*et us know about it.

*C*arry on, brothers!
*H*elp the good work along.
*E*xamine yourself to see if you are
*M*easuring up to expectations.
*I*nsist on your firm taking a
*S*ustaining Membership. It helps.
*T*alk about the A. A. C. C.
*S*tay in the game, we will win.

We are going to propose adopting a few tentative methods at the next meeting. Will you be prepared to discuss them intelligently? These include methods for acidity, sugars and soluble constituents. See Harry Weaver's paper in the December, 1918, Journal.

SOME NEGLECTED CONSTITUENTS OF FLOUR

The work of the cereal chemist is generally confined to a few routine analyses. The composition of all cereals is very complex and oftentimes very slight changes in conditions will produce a very decided difference in both the physical and chemical results. Only a few cereal chemists have the time or apparatus necessary to go into a thorough examination of any particular cereal or its commercial products. Only those tests which will give the most information in the shortest time are used. Oftentimes all the information is obtained by imperfect rule-of-thumb methods. As a result the conclusions of the cereal chemist with regard to the grade, or position, or price which a cereal product should have in the commercial world, are all too apt to be erroneous. This explains the trouble which so many flour mills have in keeping the quality of their products uniform. Without uniform quality, they cannot justly claim a uniform price. Frequently a cereal product should command a better price in the markets. It contains an important food constituent which had not been tested for in the examination. This constituent may occur in very small amounts ,it is true, but that does not alter the case, because very frequently only a small amount of some particular substance is needed by the body. This small amount, however, is needed badly, and unless this want is supplied, the organs of the body do not function properly and thus are not able to utilize to the fullest extent the more plentiful constituents.

The cereal chemist is liable to fall into a rut. Generally he analyzes a flour for ash, moisture, total nitrogen, and acidity. He tests for gluten and baking quality. This last has

more to do with the physical appearance of bread than with its nutritional value. Too much emphasis is placed upon those qualities which appeal to the taste of the customer and not enough attention to those chemical constituents which furnish an adequate and balanced food.

In the first place we must realize that wheat bread is not in itself a perfect food. Accessory foods are necessary in order to make it a well balanced ration. Milk is the most perfect food we have, next comes oat meal, then wheat flour. Other cereals follow, but their exact position is not so well defined, owing to the fact that their use is not so extensive.

Flour is called the "staff of life." It is the king of foods the world over. On account of its importance more real chemical work has been expended on it than on all of the other cereals put together. Notwithstanding all this work, the chemistry of wheat flour is far from complete. Not only do different varieties of wheat give different grades of flour, but owing to differences in soil and climatic conditions, the same variety of wheat will produce different grades of flour in different localities and under different climates.

The flour miller and the cereal chemist separate flours into grades by standards more or less arbitrary. The standards depend upon appearances and palatibility for the most part. Qualities that please the eye, or tickle the palate are rated high, while constituents that are able to supply the body with requisite nourishment are lost sight of altogether.

In case of the physical tests flours are rated according to their ability to produce a white loaf (pleasing to the eye); a fine porous texture (easy for the stomach to digest); a pleasant aroma (gratifying to the nostrils) or a large volume loaf (which makes the customer feel that he is getting more than his money's worth). These are the qualities that all too frequently govern the grade of flour. Whiteness in bread is caused mainly by the absence of dirt, which of course should always be removed, and of carrotin, the natural coloring matter of the inner wheat kernel. Carrotin is, however, perfectly harmless; at least, as far as is known to the contrary. The presence of the bran coat will darken the flour more or less. But the bran contains one of the most important constituents of the entire wheat kernel.

Why lay such stress upon digestibility? That is just what a stomach is for. In the process of evolution, what happens to a pampered or unused organ? The vermiform appendix, which is giving mankind so much trouble now days, is a case in point. Physiologists tell us that untold ages ago it was a second stomach, but through disuse, it has become a trysting place for bacteria. Besides that, it is a fact that every plant contains substances called enzymes, which are able to digest every constituent of that plant. Of course, texture is a very important factor in a physical way. The better the texture, the better the digestive juices are able to act.

What is aroma? Aroma is the effect produced upon the nerves of smell by volatile constituents of the bread. Why concern ourselves as much with those constituents which dissipate themselves through air, rather than with those which remain in the bread and are thus able to be utilized as food. It seems to me that loaf volume is emphasized too much, also.

The chemical factors which govern the grade of flour are principally moisture, ash, total nitrogen and acidity. Flours which contain more than 13% moisture are liable to ferment and become moldy. Ash is an indicator of both the quantity and quality of the inorganic salts present in the flour. Total nitrogen is a measure of

the nerve and tissue building constituents, while acidity gives some information about the parts of the kernel used in making the flour as well as the character of the resulting dough.

Like the physical characteristics, all the chemical factors just enumerated are important. But the body needs other constituents than the ones indicated by the above tests. Though flour is not a perfect food, it is important to know just how perfect it is. How many other substances does wheat flour contain, substances that are absolutely necessary for the proper nourishment and well being of the human body? The sum total, then, of these will be a true measure of the value of a given flour as food. If only these qualities are considered which have been enumerated above, the position of flour on the scale of perfection would be very low indeed.

I will now try to tell you something about these important constituents of flour which are not ordinarily considered by the cereal chemists.

The first to be considered are the enzymes. These enzymes, as you all know, are the organic catalysts. Very little is known definitely about their composition. They are found in relatively large amounts in all plants, especially in the seeds. There are a large number of different groups, each group acting upon a certain definite substance called "substrate," and capable of digesting or breaking down this compound into simpler substances. They are classified according to the substance, or substrate, upon which they act.

The principal groups of enzymes that are found in flour are, first, the proteoclastic enzymes; that is, those which are able to hydrolyze the proteins of flour and split them into proteose, peptones, and amino acids. Second, the sucroclastic enzymes, those that hydrolyze the carbohydrates, such as starch, cane sugar, etc., and break them down into the simpler sugars. Third, the lipoclastic enzymes, those acting upon fats.

There are at least five proteins in the wheat kernel: leucosin, gliadin, glutenin, a globulin, and a proteose. When flour is suspended in water, the proteoclastic enzymes act upon these proteins. The progress, or extent of their action can be followed very exactly by the formol titration method of Sorensen, or by the nitrous acid method of Van Slyke. The enzymes act very slightly at zero degrees C., their activity increases with the increasing temperature up to 40°C., where it is at a maximum. From this temperature on, it decreases until at about 60°C., the activity is about the same as at zero. The extent of protein hydrolysis increases very rapidly for the first four hours. After that it falls off until at the end of 24 hours, the increase is very slight. After 72 hours, the extent of hydrolysis is only slightly higher than at the end of 24 hours. The proteoclastic enzymes are found most plentifully in the bran coat, and in the germ, just where the amount of proteins is the largest. So far it has not been possible to isolate these enzymes in the pure state.

The sucroclastic enzymes, or those which are able to digest the carbohydrates, are very plentiful in the wheat kernel also. They seem to exist most plentifully in those portions of the kernel where the carbohydrates are found in the largest amounts. There are several groups of them, each acting upon its own particular sugar. For instance, amylase acts upon the starch; sucrase upon the cane sugar; maltase upon the malt sugar, and galactase upon a sugar called galactose. If a portion of flour is shaken up with about ten times its weight of distilled water and allowed to stand with frequent shaking, it will be noticed that after a while the milky color gradually fades and a clear or yellow color appears in the supernatant liquid. If at frequent intervals,

the test for starch is made by the iodide method, the blue starch iodide color disappears and a red color characteristic of the dextrine, appears. If at the same time reducing sugars are tested for by Fehling's method, it will be found that these reducing sugars increase in amounts as digestion proceeds. The optimum temperature for the sucroclastic enzymes is about 50°C. At that temperature the digestion is complete in about two hours.

The lipoclastic enzymes, or those which act upon the fats, are not so well known. These substances are sometimes called esterases, because their substrate are esters (fats are esters, being formed by the union of an acid and an alcohol). The products resulting from the action of these enzymes upon the fats are fatty acids and glycerine, substances which are able to be utilized to a better advantage by the animal organism. These enzymes are most plentiful in the germ of the kernel. Very little work has been done upon them in connection with flour, and a thorough investigation is most desirable.

A large amount of chemical action takes place in the fermentation of the dough. A great deal of this is due to the above mentioned enzymes. The heat of the oven probably destroys most or all of the enzymes, so that after baking the enzyme action in the bread is probably negligible. In this connection it must be remembered that enzyme action is distinctly separate from bacterial action. In all digestion experiments it is necessary to inhibit bacterial action by the addition of five cubic centimeters of toluene, or cresol for each one hundred cc. of liquid. Exhaustive experiments have shown that these two substances will kill the bacteria, but will not affect the action of the different enzymes.

II. VITAMINES.

The second class of substances that I wish to mention are called vitamines. This term is applied to a class of substances of an unknown nature which are absolutely necessary for the nourishment of the body. They are neither fats, proteins, nor carbohydrates. They contain nitrogen, but no phosphorus. They are apparently very unstable, particularly in light and in the presence of oxygen. Alcohol will extract these vitamines from a large variety of substances, both plant and animal. These bodies are required apparently in very small quantities, but they are of vital importance. Without them the organism will surely perish. A very slight lack of them will give rise to a large number of nutritional disorders, such as beriberi, pellagra, scurvy, rickets, polyneuritis, anaemia, stunted growth, etc. The blind staggers of horses and corn stalk disease of cattle are probably caused by a lack of vitamines in the food. Persons and animals suffering from the above diseases can be cured by adding vitamines to the diet or by giving a food containing them. These disorders are characterized by disturbances of the central nervous system, a lack of muscular co-ordination, and a gradual decay of the nerve fibres. Persons and animals that are properly nourished are not only free from these nutritional disorders, but have greater immunity from other diseases as well.

There are two general classes of vitamines: (1) water soluble vitamines; (2) fat soluble vitamines. They exist in the bran of rice, wheat and other cereals. They occur in milk and in the juices of seeds and leaves of plants. The bran coat and the germ of the wheat kernel have been the most prolific source for the preparation of these substances. An aqueous extract of wheat bran, given merely as a drink, will cure chickens suffering from beri-beri. Not until recently has the importance of these substances been recognized. The modern milling methods remove nearly all

of these substances from the flour. It can be readily seen that a method for the determination of this class of substances in cereals is badly needed. The true food value of a flour can not be known without an account being taken of the amount and kind of vitamines.

Another class of substances that the cereal chemist has often overlooked is the lower sugars. Besides starch and its hydrolytic products, the dextrines, there are present in the wheat kernel, cane sugar, galactose, maltose and a few others. Ordinarily, cane sugar is present in wheat to an extent of 2-3%; galactose, ½-1%; and maltose, to about 2.5%. In other words, about 5% of the wheat kernel consists of these lower sugars. While galactose and maltose are not so sweet to taste as cane sugar, nevertheless their efficiency as a food is just as great. Besides the calories of energy that they give, galactose itself is absolutely necessary for the building up and proper nourishment of the brain and nerve centers, while maltose is used in building up the tissues of the body. These substances are of the utmost importance, but ordinarily the cereal chemist takes no account of them whatever. Analytical methods for the qualitative and quantitative determination of these sugars have been worked out, and there is no reason for this oversight.

In addition to the substances that have been enumerated, the wheat kernel contains other compounds in small amounts which exert a powerful physiological action upon the life processes of man and animals. The first one of these is a substance called cholesterol. The exact amount has never been determined, but it is found at the most to an extent of a small fraction of one per cent. In appearance, cholesterol resembles the fats, but it differs from the fats in that it is non-saponifiable. It is insoluble in water, acids and alkalies. Cholesterol is found in the white matter of the brain and nerve centers and also in all the important glands. It is one of the most important physiological substances. It forms a weak molecular union with saponaceous substances and glucosides. It neutralizes the toxins, or poisons of the blood and thus protects the red blood corpuscles of the body. The red cells are being constantly attacked by hemolyzing substances and dissolved. Anaemia is thus produced. Cholesterol neutralizes, or checks the action of the lipoclastic enzymes and gives to the living cells their power of holding large quantities of water without losing their peculiar semi-fluid characters and without dissolving. A plentiful supply, then, of cholesterol is absolutely necessary for the proper functioning of the body. Cereals contain this important substance and yet no account of it is taken by the cereal chemist.

Another important compound in flour is lecithin. It, too, is related to the fats, or lipins. Some investigators call it a phospholipin; others, a phosphatide. The term phospho lipin emphasizes its fatty character, while the term phosphatide emphasizes the fact that it contains phosphoric acid. Lecithin is found for the most part in the nerves and muscles, especially in the brain. It contains the base cholin which has a powerful physiological action. It lowers the blood pressure, and has the property of making myelin forms which are liquid crystals.

In the future the cereal chemist must take into account these neglected constituents. The old idea that a food should furnish so many calories of energy is insufficient. Modern researches in nutrition have proven that other factors besides calories of energy are involved in the proper growth, maintenance and functioning of the animal body. Just as a powerful engine needs a governor, or regulator, in order that it may run smooth-

ly under wide variations of load, just so does the intricate system of muscles and nerves needs an infinite number of regulators so that the body may function properly under the varying conditions of life. It is these small neglected constituents of food that often furnish these needed substances.

Oftentimes an important food constituent is discarded, or destroyed in modern milling methods. Processes must be changed so that these substances are retained in a suitable form. When this is done, the miller may justly expect not only a better and more rational standard for his products, but a better price as well.

E. L. TAGUE,

Protein Investigations Kansas State Agricultural College.

Don't be backward about making suggestions. We love them. If you are dissatisfied with the Journal or any part of it, write the Editor, stating your objections and enclosing a two-cent stamp. You may get a reply. If you disagree with any statements or conclusions given in any papers, jot the points down in your note book and tell us about it at the next meeting. That is what our meetings are for.

Our Association has taken a new impetus. We are moving forward in a new era. Get the spirit and move with us. Be a live one, get out and *push* and, to quote our President, "Don't spell it D-R-A-G."

TABLE 1—LABORATORY MILL CONTROL DATA.

Straight Grade Flour Used.

	1	2	3	4	5	6	7	8	9
Three mills, same wheat.									
Wheat	7.30	58.81	.....	.....	.....	83.6	28.4	.....	.....
Offal	20.78	19.66	23.1	.....	.....	27.9	27.6	.....	.....
Flour	3.19	70.42	76.5	76.6	77.2	.....	.....	90.9	1.42
Wheat	7.81	53.71	.....	.....	.....	81.7	29.0	.....	.....
Offal	20.48	18.63	24.9	.....	.....	28.3	27.4	.....	.....
Flour	3.07	65.71	75.1	72.8	74.6	.....	.....	91.9	1.52
Wheat	8.19	50.20	.....	.....	.....	79.3	27.3	.....	.....
Offal	19.06	23.41	30.91	.....	.....	37.0	28.4	.....	.....
Flour	3.20	63.28	69.14	72.3	68.5	.....	.....	87.2	1.58
Three mills, same wheat.									
Wheat	7.35	55.40	.....	.....	.....	83.0	27.4	.....	.....
Offal	20.91	19.35	25.8	.....	.....	28.9	28.1	.....	.....
Flour	3.24	66.80	74.2	76.8	76.0	.....	.....	89.4	1.496
Wheat	7.59	57.40	.....	.....	.....	84.5	31.9	.....	.....
Offal	21.30	21.00	25.8	.....	.....	30.9	29.5	.....	.....
Flour	3.12	67.90	74.2	75.5	77.6	.....	.....	87.8	1.473
Wheat	7.54	54.30	.....	.....	.....	82.9	29.8	.....	.....
Offal	20.82	19.10	25.7	.....	.....	29.1	28.2	.....	.....
Flour	2.95	65.50	74.3	74.3	75.8	.....	.....	89.6	1.526

Column No. 1. Pentosan content } On 13% moisture basis.
2. Starch content }
3. Yield as reported by mill.
4. Yield as calculated from the pentosan content.
5. Yield as calculated from the starch content.
6. Flour content of wheat and offal calculated on starch content.
7. Pentosan content of flour free products.
8. Milling efficiency.
9. Flour factor, 100÷starch.

Formula No. 1:

$$\text{Yield} = \frac{\text{Pentosans in wheat} - \text{Pentosans in offal} \times 100}{\text{Pentosans in flour} - \text{Pentosans in offal}}$$

$$\text{Ex. } \frac{7.30 - 20.78 \times 100}{3.19 - 20.78} = 76.6$$

Formula No. 2:

$$\text{Pentosan content of flour-free wheat} = \frac{\text{Pentosan in wheat}^1 - (\text{Flour in wheat}^2 \times \text{Pentosan in flour}^1) \times 100}{100 - \text{Flour in wheat}^2}$$

$$\text{Ex. } \frac{7.30 - (83.6 \times 3.19) \times 100}{100 - 83.6} = 28.4$$

[1]Column No. 1. [2]Column No. 6.

TABLE II.—DISTRIBUTION OF ETHER EXTRACT IN WHEAT.

(9% moisture basis)

Description	Percentage of Ether Extracts			Percentage of Kernel represented by head
	Wheat	Heads	Germs	
No. 1 Hard Red SP. Marquis, N. D.	2.32	0.91	5.34	68.18
Red Russian Western Soft White	1.90	0.96	5.22	77.94
Blue Stem Western White	1.80	0.79	4.05	68.02
Durum, N. D.	2.44	0.99	8.98	81.85

TABLE III.—CHEMICAL COMPOSITION OF GERM.

(dry basis)

	As Obtained		Flour Free	
	F. C.[1]	O. & M.[2]	F. C.[1]	O. & M.[2]
Starch	8.40	18.21	0.00[3]	0.00[4]
Ash	5.14	4.91	5.91	4.82
Protein (N. x 6.25)	34.35	31.00	37.20	40.25
Fat	11.52	10.44	13.17	13.51
Pentosan	6.19	8.29	7.09	?
Sugars, etc.	14.74	15.21	16.86	24.34

1. Food Control Laboratory.
2. Osborne & Mendel Jour. Biol. Chem. April, 1919.
3. 1.53 used as the factor.
4. 1.25 used as the factor.

Summary and Conclusions

1. Wheat is composed of three parts, the endosperm or flour producing portion, the bran tissue, and the embryo or germ.

2. The flour producing portion contains practically all the starch and only very small quantities of pentosans and fats, the pentosans forming in part the framework of the cellular structure of the endosperm.

3. The bran tissue contains practically all of the pentosan, with small amounts of fat and no starch; the pentosan content of this bran tissue is constant, as shown in Table 1, Column 7, obtained by the application of Formula 2.

4. The embryo or germ contains practically all of the fat, inappreciable quantities of pentosan, and no starch. Therefore, the amount of fat and pentosans in any grade of flour is a measure of the amount of offal (germ and bran) contained in that flour; conversely, the amount of starch contained in wheat or any mill product is a measure of the amount of endosperm and, therefore, of the amount of flour contained in that product.

5. The accuracy of the flour yield determination of wheat as made by the ordinary experimental mill is dependent on two very important factors: the skill of the operator and the completeness of the equipment. The methods outlined in Paragraph 4 will constitute a more accurate

means of estimating the exact flour content of any given wheat. They will naturally not be subject to the errors which are inherent in a milling test.

6. The determination of pentosans or starch may be used as a check on the miller's yield reports by the application of Formula 1, as expressed in Columns 4 and 5.

7. These determinations and formulas may be used for obtaining the milling efficiency on a percentage basis, as expressed in Column 8, thereby facilitating control of the milling operations.

R. R. JACOBS AND O. S. RASK.

APPARATUS MADE AND IN USE BY MEMBERS OF A. A. C. C.

The Electric Concave Element

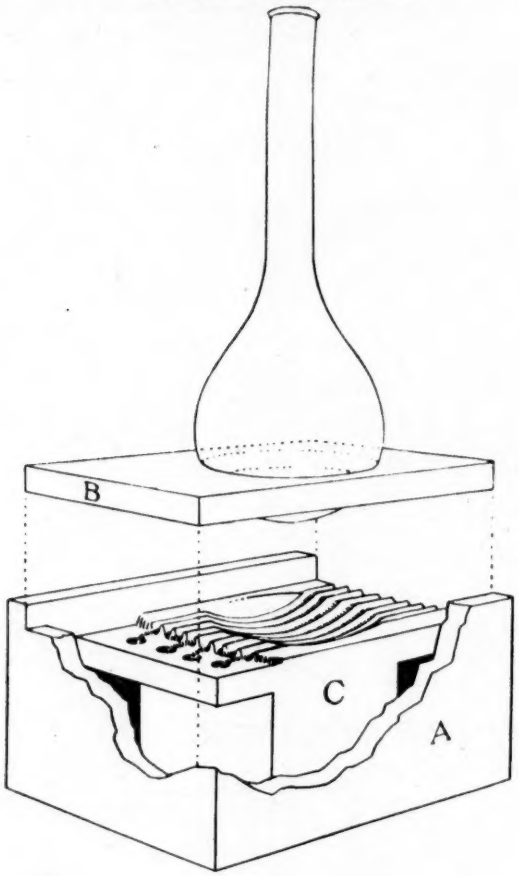


Fig. 1

The electrical concave element A designates a receptacle which is constructed of heat resisting, non-conducting material, which is to enclose the heating element. C—this receptacle may be made of any dimensions and is fitted with a cover made of non-conducting material for either electrical or other heat. B—the cover has on opening which conforms to the

shape of the flask and prevents the escape of heat and supports the flask. This construction retains all of the available heat so that it must be transferred to the work to be done and may be built in one continuous length, with compartments to receive any number of the elements, 4-6-8-12, etc.

C—the element constructed of non-combustible, non-conductive material for receiving the heating coils. The top is concave and is grooved sufficiently to receive the heating coils and prevent short-circuiting and maintains the proper spacing and alignment of the coils. In the center of the concave surface there is a hole extending through the element, which permits any liquid that may be spilled to flow through, thus eliminating the danger of submerging the coils. The element is also arranged so that it can be removed from the receptacle A at any time without interfering with the element in the adjoining compartment should there be more than one element in use.

The heating coils are arranged to maintain three different temperatures by means of a three-way switch. This facilitates the raising and lowering of the temperature to such an extent that correct results are obtained from the work done and eliminates entirely the breakage of flasks.

The heating coils are connected in two sections. The center section is on full heat for medium temperature. The other section is arranged for all of the coils to be on full heat when

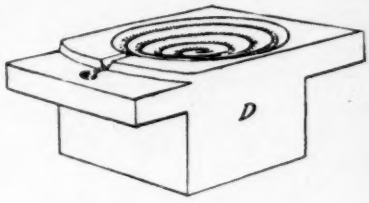


Fig 2

switched on in multiple series. Low heat is maintained when all of the coils are switched on in series.

This element can be adapted to the determination of the moisture content of wheat. J. M. HOGAN.

Buy your chemicals and supplies from those who advertise in this Journal, saying that you noticed their ad in the Journal. This means a good deal to us, fellows. Remember it!

SPECIAL PROTEIN BURETTE

For reading percentage of protein direct

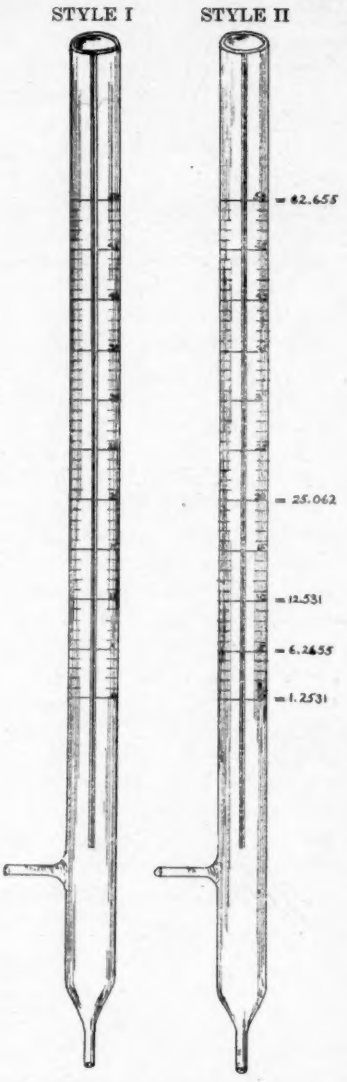
Description of Burettes—Style I is graduated in cubic centimeters with the graduation reversed, making the burette scale read from bottom to top instead of from top to bottom, as in common burette. This style is to be used with special solutions of acid and alkali which are made up so that their normality corresponds with the constant factor obtainable in the standard formula for the calculation of protein when using solutions of the normality N/10. These solutions for style I burette are of the normality N/10 times the factor 1.2531, or expressing them in concise terms, N/10 1.2531.

Style II is of special graduation for the use of N/10 solutions. It may be desired to maintain a solution of this strength as it would be more convenient where a great number of acidity determinations are made or where it is desired to have N/10 solutions for any reason. With this burette it would not be necessary to have special burette for the measuring of the acid as ordinary burettes may be used for

this the same as with style I. It would be necessary, however, to calculate the amount of acid required, but after this is once calculated it could be marked on the acid burette and no further calculation would be necessary. For example, if it is desired to start the alkali special burette at 20 it would be necessary to measure off 25.062cc. of the acid for each determination.

Use of the Burettes—With Style I, the reading of the burette when end point is reached, is the percentage of protein, when one gram of the sample is used in the determination. With this style of burette it is only necessary to have the solutions of the correct strength and to have the starting point of the alkali burette at the same reading as the amount of acid used in the determination. For example, if 20cc. of the standard acid are used, the alkali burette should be started on 20cc. and reading when end point is reached, is the result desired.

With style II, the reading at the end point is also the result desired, but the alkali burette is not started at the reading indicating the number of cubic centimeters of acid used, but starting point of the alkali burette is that point at which the amounts of the two solutions would be equal. As explained before, if it is desired to start the alkali burette at the 20 mark it would be necessary to use 25.062cc. of acid for the determination.



Constructon of the Burettes—The burettes should be made of Shellebach tubing with the blue and white lines to facilitate reading. It is also recommended that a meniscus float be used in connection so that very fine and accurate readings may be made. Burettes are made with side tube for refilling, and are used with pinch cock though they could easily be made for the use of ground glass stopcock for very fine work. However, for the routine work for which this burette was designed, the pinch cock is sufficiently accurate for all ordinary work. Burette is attached to reservoir and is refilled by gravity. The use of another burette of the common type can easily be obtained by inserting a glass T joint in the supply line and having a common burette attached. This is especially recommended in the use of style II, where solutions of normality N/10 are used,

ALGEBRAIC FORMULA OF THE BURETTES.

$$\frac{\text{Normality} \times \text{cc neutralized} \times 0.14 \times 5.7 = \% \text{ Protein}}{1 \text{ (or No. grams used)}}$$

Let X = normality
Y = number cc neutralized, then

$$\frac{X \times Y \times 0.14 \times 5.7}{1} = \% \text{ protein}$$

$$X = \frac{1}{Y \times 0.14 \times 5.7} = \frac{1}{0.798Y}$$

assuming Y = 1, then

$$X = \frac{1}{0.798} = 1.2531 \text{ equals factor}$$

Normality of solutions equals N/10 1.2531.
The following formula may be used:
Let X equal factor 0.14
Y equal factor 5.70
a equal No. cc acid used
b equal No. cc alkali used
P equal percentage protein

Then,

$$\frac{N/10\ (a\text{-}b) \times 0.14 \times 5.7}{1} = P$$

$$P = N/10\ (a\text{-}b)\ XY$$

$$\frac{P}{10} = N\ (a\text{-}b)\ XY$$

$$N = \frac{\frac{P}{10}}{\frac{(a\text{-}b)XY}{1}}$$

$$N = \frac{P}{10\ (a\text{-}b)XY}$$

Let P equal 1, and a and b equal 1, then

$$N = \frac{1}{10\ (1\text{-}1)\ XY} = \frac{1}{10 \times 0.14 \times 5.7}$$

$$N = 1.2531\ N/10$$

as then acidity determinations can be run with ease. Also in the case of style I where special solution is used another common burette can be used to advantage, it being easier to calculate a few acidity determinations than the many protein determinations usually run in a control laboratory.

Burette was designed to facilitate the protein work in laboratory where speed was essential, and was found to not only help in this way, but allowed of immediately setting down results on permanent record. In this way there is no chance of confusing determinations and does away with the chart that ordinarily is used by chemists in this line of work. Two of these burettes have been installed and each has proven entirely successful and have never failed to check with all other determinations made in any way with different strength solutions and various burettes.

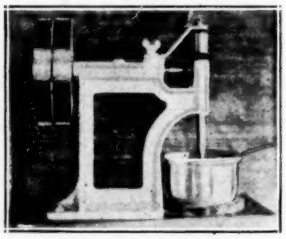
S. J. LAWELLIN.

Hats off to our new President! He is one of the real live ones and you can bet your sweet life there will be something doing all the next twelve months and you are expected to get in the game. You are just naturally going to have to get down and dig to keep up with what is going on in the Association but the officers want your help. Do what you are asked to do promptly, volunteer if you will. Their time is as valuable as yours.

We are proud to have one new firm on our Sustaining Membership list, notice it please. Now where are the other fifty? John, where is yours? Some to you Fred, Ralph, Dean, Sam, Robert and so on. Be a GO-GETTER!

How do you like the apparatus section of this issue?

THE BUCK MIXER



The purpose in designing this machine was to provide a single loaf bread mixer for cereal laboratories which would mix the dough in such a manner that it could be easily removed from the machine in a single compact mass.

Description:

Frame—Cast iron bored for horizontal shaft and vertical shaft.

Base—Hard wood.

Horizontal shaft—Tight and loose pulleys at one end—bevel gears at other end.

Vertical shaft—Bevel gears at one end—brass mixing blade at other end.

Clamp and set screw—fastens over top of vertical shaft, holding shaft in place. May be moved to side by loosening set screw, thus allowing shaft to be raised.

Power—By two-inch belt to tight and loose pulleys.

R. P. M.—100 to 120.

How to use:

Raise mixing shaft and remove pan. Place dry ingredients in pan and hollow out to bottom. Add liquid. Place pan, lower mixing shaft and clamp in place. Allow mixer to run about three minutes. Scrape down sides of pan by means of thin spatula while mixer is running. When well mixed stop machine. Raise mixing shaft. The dough ball if of the right consistency will remain in the pan from which it can be easily removed.

This mixer is made by the J. B. Ehrsam & Sons Machine Works, Enterprise, Kansas.

C. F. Buck.

A COMBINATION BURETTE

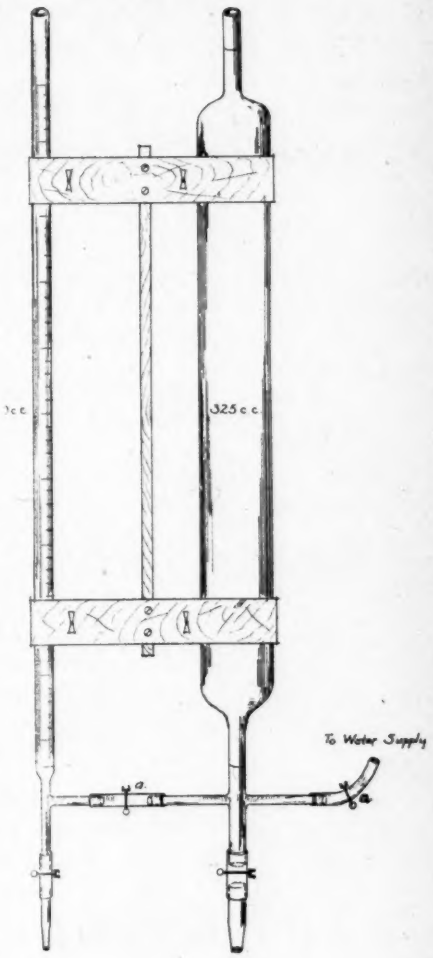
For the Rapid, Accurate Delivery of Water to Dough Mixer.

This piece of apparatus can be set up by anyone in their laboratory from material at hand, and will be found a great aid where it is necessary to mix a large number of doughs, as measuring out the water with a graduated cylinder is more or less troublesome and inaccurate.

Two burettes, one of 50cc capacity and the other of any desired capacity, depending on the amount of flour used for a loaf, are fastened together with iron clamps as shown. The top hair lines of the two should be on the same level.

In use the water supply may first be brought to the desired temperature, and then connected with the water inlet in such manner that it syphons into the burettes. To fill, open the two stopcocks, a, a. After filling, it may be necessary to regulate the level in the two sections, as one will sometimes fill more readily than the other. Start mixer, and deliver the portion from the large section first. It is then possible to secure the desired consistency of the dough by adding the necessary amount of water from the 50cc burette.

L. E. LEATHEROCK.



AUTOMATIC ELECTRIC ALARM FOR MOISTURE TESTER

This apparatus is a modification of the Electric Alarm Thermometer, as used with the ordinary moisture tester.

The lighting circuit furnishes the current, using an ordinary door bell and a so called door bell transformer.

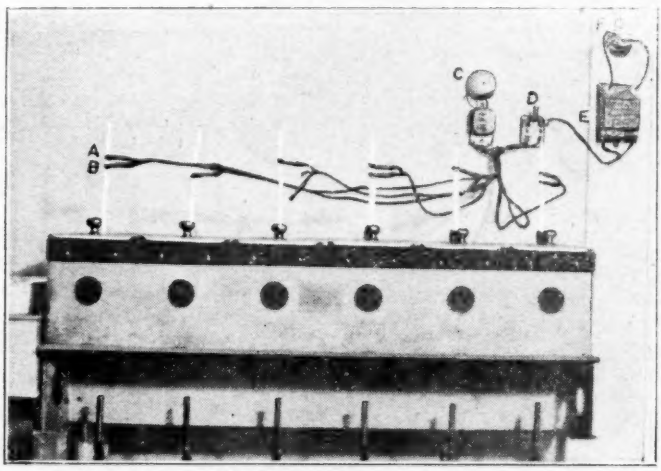
A is contact band at 175°C.; B, contact band at 165°C.; C, electric bell; D, double throw switch; E, transformer; and F, lighting circuit.

The thermometer is made with the high contact point at 175°C, so that the alarm rings 5° before the heat is to be turned off. With the exception of the two contact bands, the thermometer is of the same specifications as ordinarily used.

Wire spring clamps or clips are attached to the end of each wire, and being open at the ends are easily slipped on and off of the thermometer contacts when the alarm rings, or the flask is being cleaned.

A moisture tester equipped in this manner requires no attention whatever, after starting the fire, and one can go about other work, forgetting the moisture tester until the alarm rings, after which there is plenty of time for disconnecting the clips and turning off the heat.

R. A. LUSK.



NOTICE TO A. A. C. C.

Please remember that you should always place your orders for apparatus and supplies with those firms which advertise in this Journal and above all, *tell them that you saw their advertisement in this Journal.*

It is your duty to mention this publication when ordering for it means much to the advertiser to know that he is getting his money's worth and to us to be able to get his renewals.

C. R. SOUTHWELL, Business Manager.

Cenco Analytical Balance

No. 486

The rapid development of chemical industry in the past five years has led to an unprecedented demand for analytical balances. To meet this demand, we induced Voland & Sons, one of the largest and best known manufacturers of analytical balances in this country, to make for us in large quantities balances which we guarantee to be suitable in accuracy and rapidity for any quantitative or industrial laboratory work. By standardizing all the parts, and developing dies, jigs and automatic tools for making these parts, the process of manufacture has been made as efficient and economical as modern manufacturing genius knows how to make it. For this reason, and because of the large quantities which we had made up, we have been able to reduce the price to an amount for which no previous American balance of the same quality has ever been sold.

SPECIFICATIONS.

Capacity	200 grams
Sensibility	1/10 mg.
Knife edges and bearings	10 mg.
Weight of rider	10 mg.
Beam	polished aluminum
Length of beam	6 in., graduated in 1/5th mg.
Divisions of beam	50 to right of center
Size of case	16½x17x9¼ inches

Distinctive Features of the Cenco Analytical Balance

Knife edges free from contact when balance is at rest.

Independent arrests for beam, stirrups and pans.

Fenders at end of stirrup supports to check extreme swing of beam and prevent jarring or sliding of stirrups on knife edges.

High sensibility and rapidity of swing.

Graduations of beam white on black background.

Index plate graduated in red.

No steel in construction of balance and hence no corrosion.

Case of fine polished mahogany with counter-poised front door and glass on all sides.

Simple rider construction with patented rider hook.

No. 486. Balance, Cenco Analytical, with wooden case and leveling screws....$42.50

No. 486A. Balance, Cenco Analytical, same as No. 486 but with black plate glass base 50.00

Central Scientific Company

460 East Ohio Street

Chicago **U. S. A.**